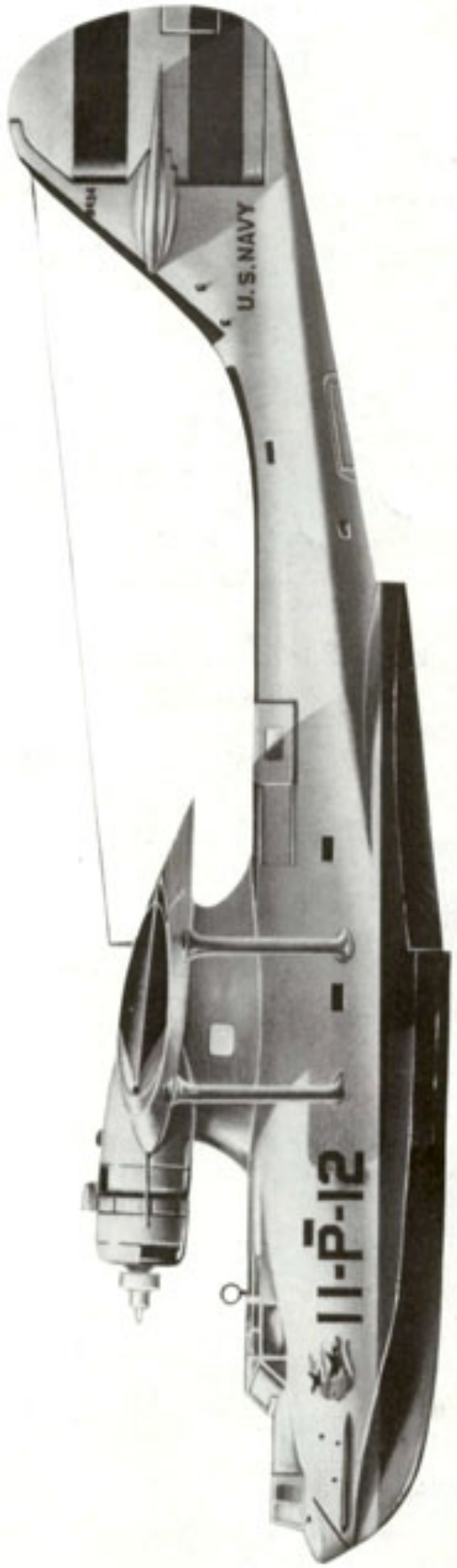
PROFILE PUBLICATIONS

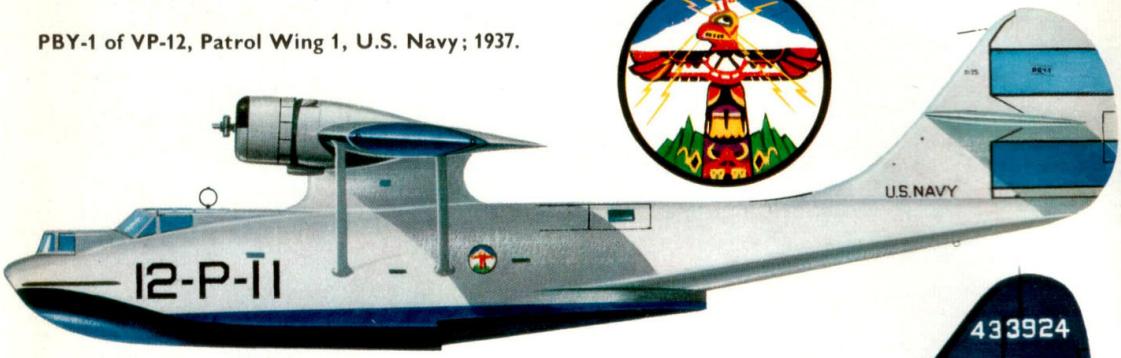
The Consolidated PBY Catalina

NUMBER 183



VP-12.

PBY-1 of VP-12, Patrol Wing 1, U.S. Navy; 1937.



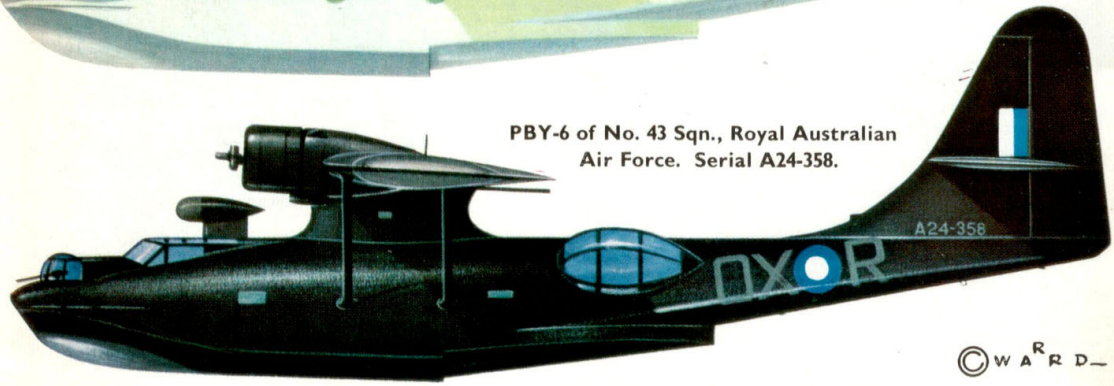
OA-10 (Canadian Vickers) of U.S. Navy; air-sea rescue duties, 1947.

U.S. Coast Guard.

PBY-5 of U.S. Coast Guard, 1945.

Catalina Mk. IVA, No. 202 Sqn., R.A.F. Coastal Command; Lough Erne, N. Ireland. Serial JX269.

PBY-6 of No. 43 Sqn., Royal Australian Air Force. Serial A24-358.



©WARD

The Consolidated PBY Catalina

by Everett Cassagneres

PBY-3 (BuNo 0842) prior to assignment to a unit; this shows to advantage the sliding hatches of the earlier variants.
(Photo: Convair via Donato)

The Consolidated PBY, named "Catalina" by the R.A.F., earned everlasting fame during the Second World War for its reliability, versatility and ability to absorb tremendous punishment. In the Atlantic, Pacific and Arctic Oceans it gained the respect, admiration and affection of the men who flew it. Today, over 30 years after the first flight, the Catalina has a considerable future and will probably be a familiar sight in the skies of the world for many years to come.

More PBY's were built than any other flying-boat during the Second World War and, during and after the conflict, served with over twenty countries. Although slow and vulnerable to enemy fighters, they could fly tremendous distances both on patrol and tracking duties. Besides air-sea rescue duties, they also strafed enemy positions and launched torpedoes; without them the U.S. Forces would have lacked the flexibility that was to characterise their efforts.

The PBY was designed by the Consolidated-Vultee Aircraft Corp. (now Convair) which owes its great success in the aviation industry to Major Ruben Hollis Fleet. Fleet was born in 1887 and was originally a real estate operator. He organised the Consolidated Aircraft Corporation with the Vultee Aircraft Corporation to form the Consolidated Vultee Aircraft Corp.; thus on 29th May 1923 "Convair" was born. Fleet was general Manager from 1923 until 1941 and under his guidance the firm, based at Buffalo, N.Y., prospered, establishing itself as a supplier of Naval patrol flying-boats.

To facilitate operations, the firm sought a plant site which would permit all-the-year-round flying conditions and an ice-free harbour. Fleet studied the possibilities of San Diego, California and, late in 1934, made arrangements to lease 70 acres of Lindbergh Field, already the home of American Airways (now American Airlines) and the Ryan Aeronautical Company. On 20th October 1935 Consolidated's new plant was formally dedicated. Visitors toured a large spacious factory of steel, iron, stucco with glass sides and corrugated iron roof which afforded 247,000 square feet of floor space, ten times the area available at Buffalo. An option was held to lease an additional 40 acres of municipal tidelands. Consolidated grew rapidly and ultimately produced nearly 13% of the United States' total wartime aircraft production in thirteen divisions stationed across the U.S.A.

While still located at Buffalo, N.Y., Consolidated received an order from the U.S. Navy, dated 28th October 1933, to build one experimental patrol aircraft designated XP3Y-1. The prototype (c/n 9459) was first flown on 21st March 1935 at Hampton Roads piloted by William B. Wheatley. Powered by two 825 h.p. Pratt & Whitney XR-1830-54 Twin Wasp radials, the aircraft was an all-metal monoplane featuring a wing mounted on top of the hull by a pylon (housing the flight engineer's quarters) and two sets of streamlined lift struts running from the water-line to the wing panel—centre section joint. The most interesting feature was the float retraction system, the assemblies retracting outwards to the ends of the wings to become "wingtips"; this remained a trade-mark of all PBY's.

Just seven days after its first flight, the XP3Y-1 was flown from Buffalo to Norfolk, Virginia for flight tests. It was returned to the factory in October 1935 and fitted with 850 h.p. Pratt & Whitney R-1830-64 radials. It was then redesignated XPBY-1.

While it was at Norfolk the prototype embarked on a spectacular pair of flights. It first flew from Norfolk to Coco Solo, Canal Zone, non-stop; and then, as an encore, flew from Coco Solo (Christobal Harbour) to San Francisco Bay, California, again non-stop. Arriving on 15th October 1935, the XP3Y-1 created an impressive new International record for seaplanes with a distance of 3,281·402 statute miles. The crew of five was commanded by Lt. Cdr. Knefler McGinnis, who had led the massed P2Y flights of 1934.

This particular record flight was to have terminated at Seattle, Washington, but due to the rudder design, the aircraft had difficulty in getting off the water with a full fuel load. The problem was that when the pilot attempted to "get on the step" the fully laden aircraft would drop its tail in the water and the tail then acted as a water rudder. The pilot would temporarily

lose control and have to close his throttles immediately. The rudder was later modified and this embarrassing fault was eliminated.

FIRST ORDERS

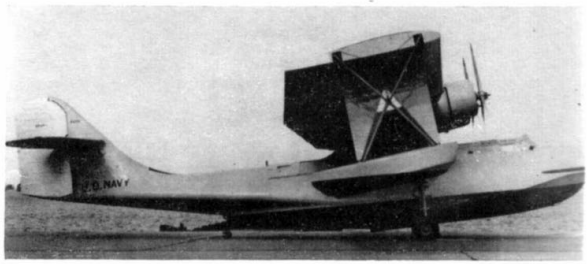
Impressed by the obvious potential of the XP3Y-1, the U.S. Navy ordered 60 P3Y-1's, later redesignated PBY-1's, on 29th June 1935. Eleven were delivered in 1936 and 49 in 1937, the serial numbers being *0102* to *0161* inclusive. The first unit to receive the PBY-1's was VP-11F, in October 1936. (It is of interest to note that the first PBY-1 was launched on 5th October 1936 in the same bay where Glen Curtiss made the first American hydroplane flight 25 years earlier. This was Coronado Bay, San Diego, adjacent to the Consolidated factory.) As a result of the U.S. Navy order, Consolidated then enlarged their factory area to 543,000 square feet and included a paved yard in which final assembly could be conducted. In order to finance construction, the directors of Consolidated authorised the sale of 22,976 shares and the insurance of preferred stock in 1936. A block of 1,024 shares was set aside for sale to selected employees.

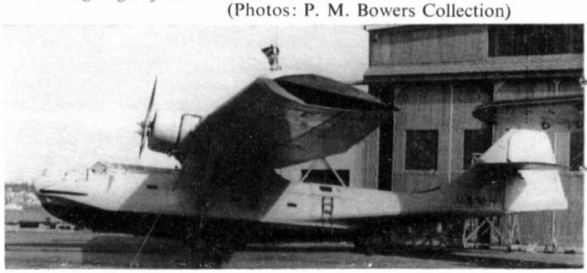
Before long the U.S. Navy ordered a further 50 machines (BuNos *0454* to *0503*). These were basically similar to the PBY-1's, having R-1830-64 radials and only detail differences; designated PBY-2, 36 were delivered in 1937 and the remainder in 1938.

During 1938 the PBY was released for export and immediately the U.S.S.R. purchased three (PBY-3) aircraft together with a manufacturing licence. Eighteen Consolidated technicians accompanied the aircraft to Russia to assist in establishing a production line at Taganrog. The Russian-built version was designated GST and it appeared late in 1939, powered by Mikulin M-62 radials. Several hundred were built for the Russian naval air arm, and they remained in service, in company with lend-lease PBY-6A amphibians, until the mid-1950's.

NEW DEVELOPMENTS . . . AND WHEELS

Sixty-six aircraft with 900 h.p. R-1830 Twin Wasp engines were ordered by the U.S. Navy as PBY-3's. Ordered in November 1936, these began to enter service in late 1937 but by this time a still more powerful variant, the PBY-4 was on the stocks. Thirty-three were ordered on 18th December 1937, powered by 1,050 h.p. R-1830-72 engines. The first PBY-4 was tested in May 1938 and this featured the sliding beam hatches which had been a feature of the design thus far. The remaining 32 were delivered to the U.S. Navy with new waist "blisters" which were to characterise all subsequent PBY's. These blisters enclosed the rear gunner's position and also afforded a panoramic view of the sea on overwater patrols.



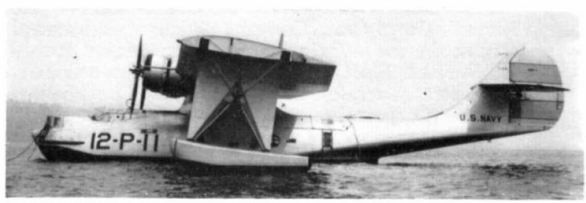


Two views of the original XP3Y-1 (BuNo 9459)*; in both these photographs the hull is painted light grey, not silver.* (Above) *The aircraft in March 1935 and* (below) *with additional area at the trailing edge of the rudder.*
(Photos: P. M. Bowers Collection)

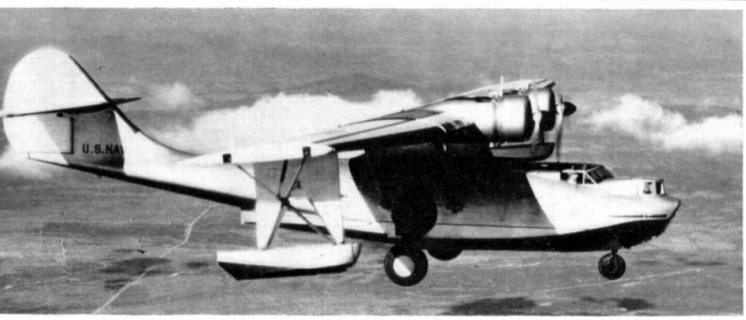
Each blister housed a ·50 calibre machine-gun; one ·30 calibre gun was mounted in the nose turret and one in the ventral tunnel.

Patrol Wing Ten (comprising VP-101 and -102) was equipped with PBY-4's and during the period 1940 to 1942 was stationed in the Philippines. All told the unit operated 28 aircraft; all but two were lost on operation in that area.

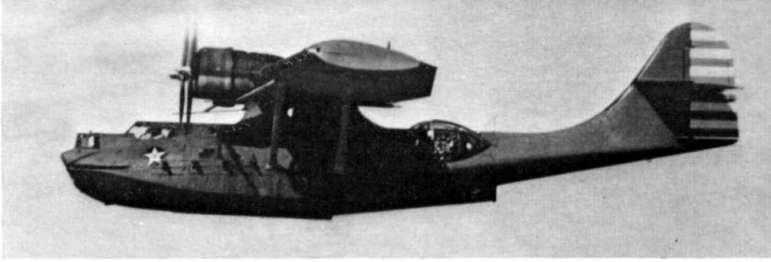
In April 1939 PBY-4, c/n 1245, was returned to the manufacturer to be converted to amphibian configuration fitted with a retractable main undercarriage and nosewheel. The main wheels were fitted with oleo shock-absorbers and retracted into wells in the fuselage sides. The nosewheel located at the bow was completely enclosed by automatically-operated hatches when retracted. All three wheels were operated by a central hydraulic power drive and the operations were



PBY-1 (*BuNo* 0135) *carrying the insignia of VP-12 just visible behind the rear wing-float strut.*
(Photo: William T. Larkins)



The first amphibian, the XPBY-5A, poses for the camera with wheels down.
(Photo: Convair via Donato)



PBY-5A showing early wartime markings (winter 1941-42) with red and white rudder stripes and small national insignia with red centre.
Photo: Author's Collection)

carried out in sequence automatically. Extension and retraction of the gear was controlled by a single lever. The hydraulic power was derived from the main power plant or from an auxiliary unit, but in emergency the gear could be operated manually.

After completion on 22nd November 1939, this particular PBY-4 became the XPBY-5A. Because of its increased utility potential, all existing PBY contract aircraft were then modified with retractable gear, 33 being completed as PBY-5A's. One hundred and thirty-four additional PBY-5A's were ordered on 25th November 1940 and deliveries commenced in December 1941.

The original PBY-5 design was powered by 1,200 h.p. R-1830-82 engines and featured a modified rudder. The APBY-5A designation was applied to Catalinas used in an administrative capacity. These featured about five additional windows on the fuselage side just aft of the cockpit (see photo).

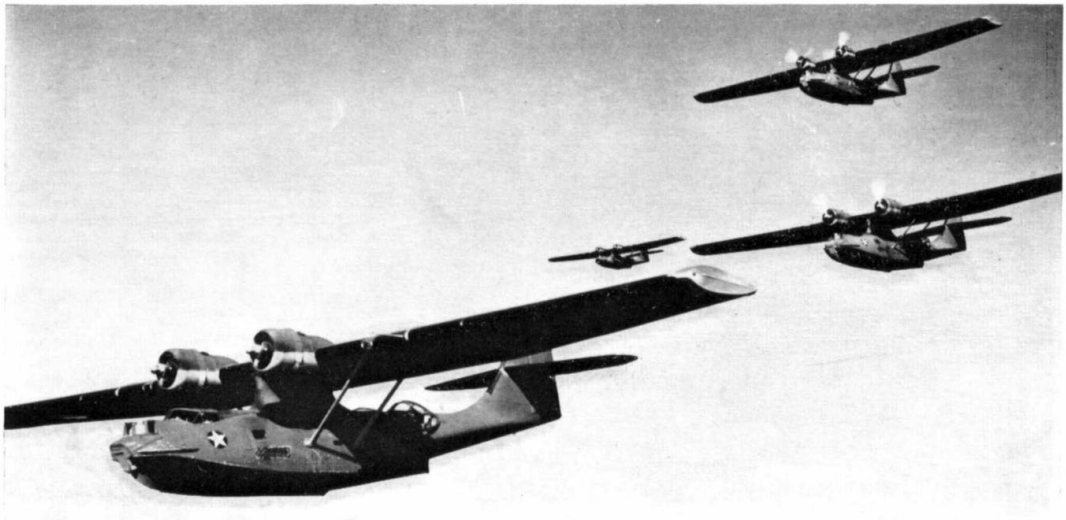
Contracts placed in 1941 and 1942 called for 586 more PBY-5 flying-boats, 627 further PBY-5A amphibians and 225 PBY-5B amphibians (these being for the R.A.F. under lend-lease). The last production version was the PBY-6A, this being developed from the Naval Aircraft Factory's PBN-1 Nomad. The Naval Aircraft Factory modified the basic design by sharpening the hull bow, fitting a 20° taper step amidships, extending the after step five feet further aft, adding a shallow breaker step just forward of the tail, and increasing the height of the vertical fin and rudder by 26 inches. The rudder featured a horn balance and the elevators featured an overhanging-type balance. The wings were also strengthened to take 28,000 lb. gross weight and two integral fuel tanks were added to make total fuel capacity 2,095 gallons. Although the order for 156 PBN-1's was received in July 1941 the first machine did not appear until February 1943. Production PBY-6A's were distinguished from the Nomads by a radome mounted above the pilot's cockpit and they were considerably faster at 196 m.p.h. A twin-gun ball-turret was fitted in the nose mounting ·50 calibre machine-guns and ·30 calibre guns were featured elsewhere. The prototype PBY-6A was first flown in January 1945.

Consolidated Vultee's New Orleans plant built 75 aircraft of which 48 went to the Soviet Union under lend-lease. The U.S.A.A.F. procured 75 PBY-6A's (as 0A-10B's) and used them for air-sea rescue duties in Navy camouflage with serials *45-57833* to *-57907*.

FLYING CHARACTERISTICS

With most aircraft one finds differences of opinion concerning the merits and demerits of the design but opinions of the Catalina are remarkably uniform. With the increase in horse-power and refinements in hull design, quite a change came over the Catalina and most comments here refer to the PBY-5 and -5A variants. However, two points about the earlier variants *vis-à-vis* the later models are worthy of note. Landing technique, a test of seamanship rather than airmanship, did not radically alter, the "power-on" technique being already established as the best method of landing a flying-boat. The secret was to get the aircraft down to a low flying speed in the best attitude for landing and fly it on to the water. Take-off became a much more sophisticated art; in the older PBY's (and any other flying-boat of the time) the technique was to execute a sharp pull on the control column in order to "unstick"—a move which actually defeated its purpose more often than it helped. Although a

An impressive formation view of PBY-5's over Alaska in August 1942. The censor has deleted the unit marking of the nearest machine.
(Photo: U.S. National Archives)



judicious "pull-back" could make a doubtful take-off certain, a similar execution at the wrong moment could ruin any chances of a successful take-off. Later variants were "unstuck" by setting the control adjustment to a predetermined point, according to the position of the centre of gravity, and then flying the aircraft out of the water with no violent "rocking".

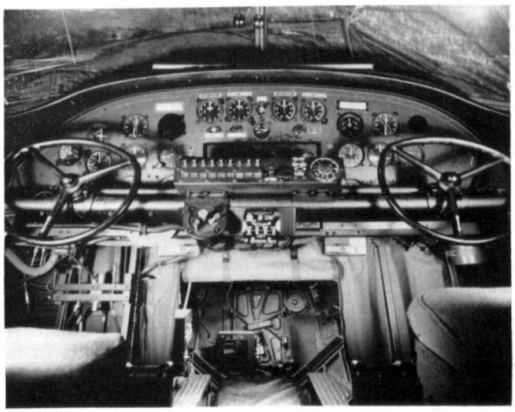
In the air the PBY was similar to most flying-boats of similar size and power, with no special peculiarities. Taxiing into the wind was easy as long as the sea did not wash over the windshield and result in obscured vision and a drenched pilot. Taxiing in a strong cross-wind was something else again—if the wind was very strong, the technique was to full throttle one engine frequently while the other was kept wide open. When a buoy had to be made, one of the crew would "take it" from the bow of the aircraft with a boat-hook. He would then tie a light line as soon as possible, and "snub" the buoy up close to the aircraft to secure the riding pendant and "preventer".

The most important reason for operating an aircraft like the PBY was to take pairs of eyes to where they could scan vast areas of the sea and the space above the sea. For this reason it was imperative that the pilots should have little else to do; as a result it was customary to turn over straight-and-level flying to the autopilot. The military value of the device was of course immeasurable.

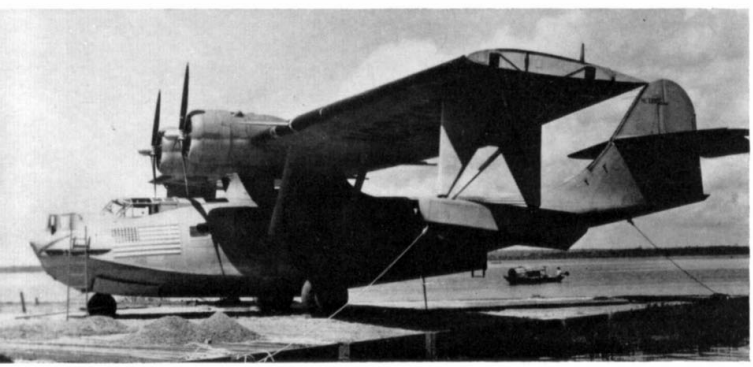
The present writer's source of personal impressions of the PBY has been William Scarborough, who was assigned to VP-72 and -91 between March 1941 and April 1943. A Patrol Plane Commander with 1,700 hours on PBY-5's and -5A's, he has this to say: "Most of my time was spent on patrol operations, endless hours of boredom punctuated by brief moments of sheer tenor". At this period Scarborough was based in the combat areas of Numea, Espiritu Santu and Tulagi. "We would usually make a pre-dawn launch involving a 12-hour mission and return in the dark." Needless to say this was very frustrating when one considered that being tender-based, all transportation from ship to aircraft was by small boats which were not regular or dependable. "After making the buoy assigned, we would frequently wait for the better part of an hour for a boat to take us to the ship."

Flying aircraft that were quite old and "tired", in a period of sixteen months Scarborough only failed to complete one mission because of aircraft trouble—quite a record for "tired old" aircraft. Despite the fact that instruments often went unserviceable, few problems were encountered. "If only one tachometer was functioning, we would set that engine as required

Coast Guard PBY-5 about to enter the water at San Francisco in June 1942; note the enlarged national insignia without red centre. (Photo: W. T. Larkins)



(Above, top) *The "office" of the Catalina showing the pilots' instruments.* (Bottom) *PBY-5 production line; the white marks on the print are the work of the censor on the original negative deleting radar details.* (Photos: Convair via Donato)



(Left) *One of the first civilian "Cats", NC33300, showing U.S. flag marking, seen at Manaos, Brazil, in August 1943.* (Photo: U.S. Air Force)

White and light grey PBY-5A of Patrol Bomber Squadron 63, the famous "Cowboys from Blitzville", carrying retro-rockets under the wings. (Photo: U.S.N. via Donato)

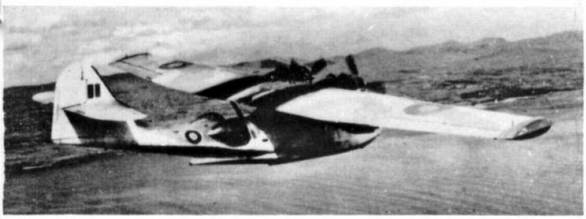
and synchronise the other engine to it (by ear) with no sweat!" Much of this operational success must be attributed to weather that was generally so good that a minimum of problems existed as far as getting in and out of harbours was concerned.

The Catalina's flying qualities demanded plenty of muscle and pilots always dreaded being assigned an aircraft with an inoperative autopilot. Twelve hours flying in this condition, even with three pilots aboard, was exhausting work, much of it being done at 500 feet altitude to allow them to be "ready to get right on the deck" if another aircraft was spotted. "The cockpit became most uncomfortable considering the temperatures were always in the nineties."

Take-off under any conditions was quite an art but sometimes a prayer was called for. "A black night with no wind and a full load, with a couple of lighted buoys (usually a flashlight on a wingfloat) across the bay as the only reference for line-up. Surround this black hole with high hills and clutter it with dozens of ships and numerous small aircraft running across the channel, and the picture is evident."

"For thrills nothing surpasses the situation of running full throttle and being just over the hump and on the step, then hitting the huge wake left by a crossing landing-barge or PT-boat." A humorous aspect was the "standard operating procedure" in the event of a hard landing. A drawer full of freshly sharpened pencils, of all things, was available for use as "plugs" to insert in the rivet holes when the rivets popped out of the hull bottom after a hard landing !

Under normal conditions there were no problems in landing the PBY. "The accepted technique", said Scarborough, "was a power-on approach with a flat-glide landing, then hold the 'plane on the step and "fly" as close to the buoy as possible—all this to reduce taxi time to a minimum. With a high wind and sea state, or in the open sea, we always made full-stall landings, and again, rarely had problems."



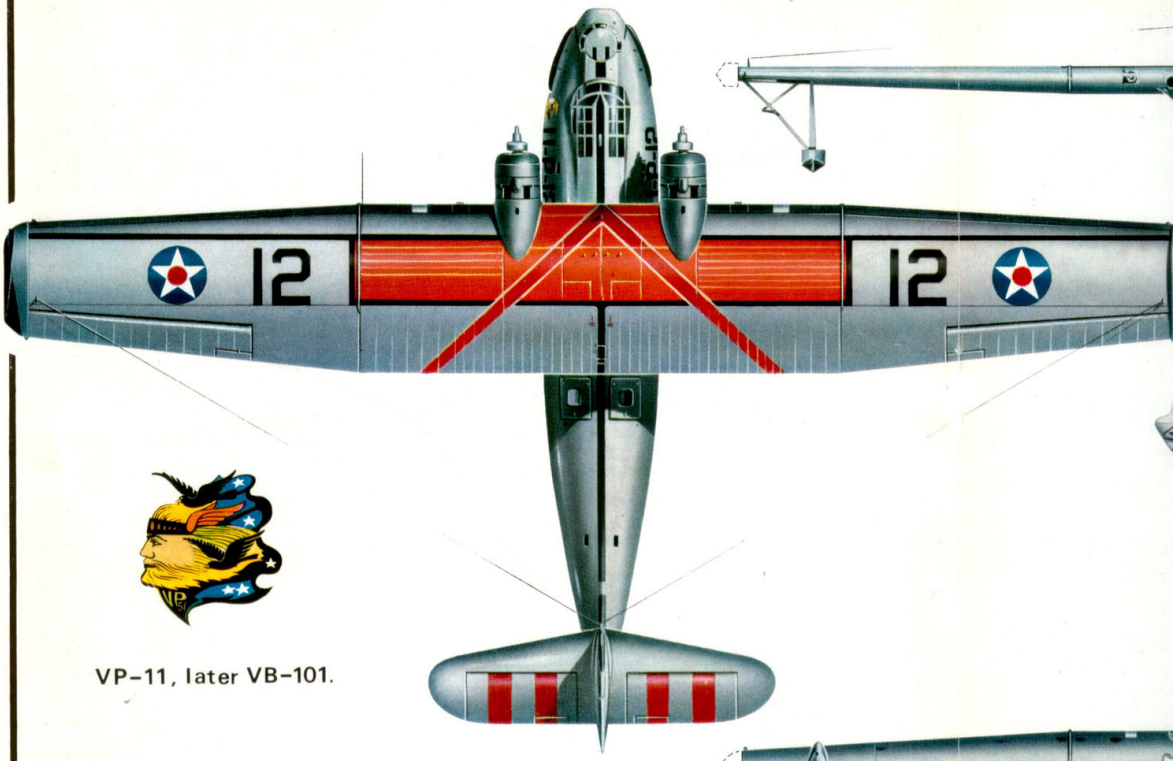
R.A.F. Catalinas; (above) *one of the few Mk. III amphibians,* FP533, *and* (below) JX223 *"M" of No. 202 Sqdn. based in Northern Ireland, a Mk. IVA.*
(Photos: D. Menard and R. Ward)

BRITISH CATALINAS

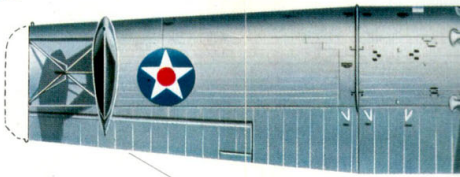
It was with the R.A.F. that the PBY first saw action. Britain had purchased a Model 28-5 (the Consolidated designation of the PBY-5) in 1938 and this was flown across the Atlantic in July 1939 and evaluated at Felixstowe as *P9630*. After trials the machine was handed over to No. 228 Squadron for further testing, and also used by other squadrons. Thirty were ordered as the Catalina I (*W8405-8434*) and deliveries commenced early in 1941. Later orders for Mk. I's were delivered as *Z2134-2153* (five to Canada), *AH530-569* (*AH534* to Australia) and *AJ154-162*. Australia received 18 Catalina I's (*A24-1* to *18*) with modified armament while Canada received 14 Mk. IA's (*9737-9750*) also with modified armament. The R.A.F. received seven similar Catalina II's (*AM264-270*) early in 1941 and the Catalina entered service during that Spring. Coastal Command's new mount quickly earned its spurs when 'WQ-Z' of No. 209 Sqd. spotted the *Bismarck* on 26th May 1941. Two Catalinas shadowed the ship until units of the Royal Navy were able to make contact and sink the ship. One of these was flown by Lt. Smith, U.S.N. who was checking out a British pilot on the type—from that day forth he was known as "Bismarck" Smith. By mid-1941 three squadrons of No. 15 Group were based in home waters with the type. Nos. 209 and 240 were based at Lough Erne and No. 210 Squadron operated from Oban; a few were also based at Gibraltar with No. 202 Squadron.

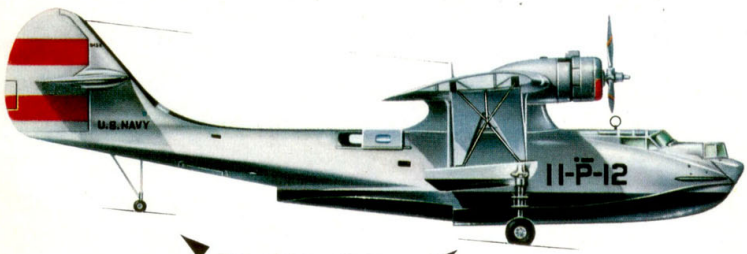
Armament comprised one moveable Vickers "K" gun in the bow position, twin Vickers guns on manual double-yoked mountings in each blister turret on either side of the hull amidships and a further Vickers

(*continued on page 10*)

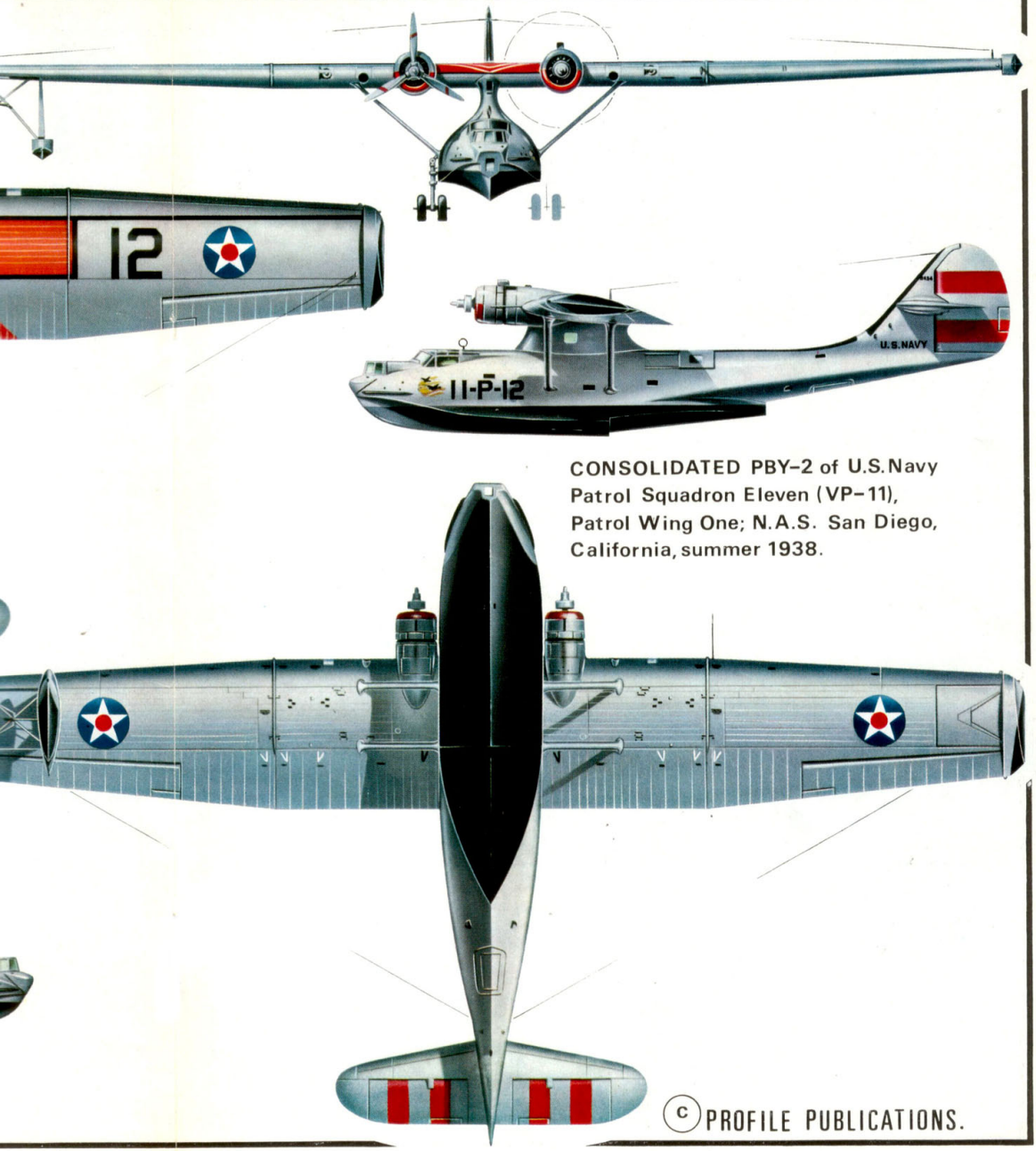


VP–11, later VB–101.





Beaching gear.



CONSOLIDATED PBY-2 of U.S.Navy Patrol Squadron Eleven (VP-11), Patrol Wing One; N.A.S. San Diego, California, summer 1938.

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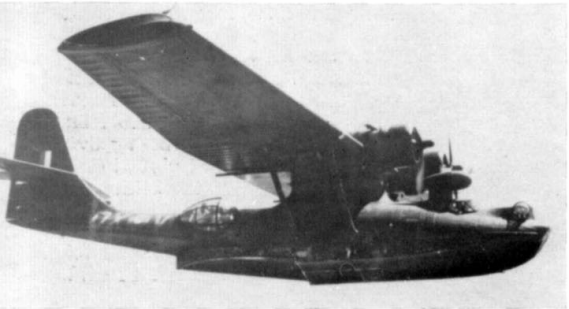
One of the few R.A.F. Catalina VI's seen at the Boeing Canada factory. The aircraft, JZ829, bears the legend "The David Hornell" on the nose after the Canadian V.C. winner who flew the Catalina. (Photo: P. M. Bowers)

gun for rear protection in a blast tunnel firing aft beneath the hull. External racks for bombs or depth-charges were fitted beneath the wings on the centre-section panels.

During 1942, thirty-six Mk. IIA's arrived; these had originally been built (by Canadian Vickers) for the R.C.A.F. serialled *9701-9736*. On transfer to the R.A.F. they were given serials *VA701-736*, a most unusual practice as the *VA*-range was not reached until 1944-45. The beginning of Lend-Lease was signified by the arrival of the Catalina IB, *FP100-324*, ordered by the U.S. Navy as the PBY-5B, although exclusively for Lend-Lease. These 225 aircraft were similar to the Mk. IA and two of them, *FP221* and *224*, were delivered to B.O.A.C. as *G-AGIL* and *G-AGFM* respectively. Britain received only 12 amphibians, *FP525-536*, which were not used by Coastal Command but on the North Atlantic Ferry Service between Canada and Prestwick. Equipment changes in the basic PBY-5 brought the Catalina IVA in three batches, *JX200-269*, *JX570-585* and *JV925-935*, and this variant entered service with Coastal Command during the summer of 1943. The IVB, equivalent to the U.S.N. PB2B-1 and built by Boeing in Canada, served mainly in the Indian Ocean and Far East. Two batches (*JX270-437* and *JX586-610*) were delivered—193 machines in all—although *JX287,525* and *577* went to B.O.A.C. A number were modified as ASR.IVB's with a dorsal radome to the rear of the pilot's cockpit; they were used on anti-submarine duties. There was no Mk. V (this being reserved for the PBN-1 Nomad) but a small number of Mk. VI's were supplied from Boeing in Canada. They were PB2B-2's similar to the Naval Aircraft Factory PBN-1, however, they were not used on operations.

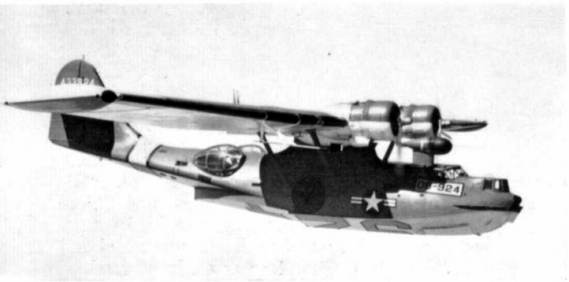
The R.A.F. Catalinas were usually delivered to Saunders-Roe at Beaumaris and Scottish Aviation at Prestwick for processing prior to delivery to the R.A.F. Early Catalinas were painted brown and green above and sky below, with dull red code letters, but the brown was replaced by grey by 1942 and the codes were painted in grey. During 1942 a radical change was made when the undersurfaces, hull sides and vertical tail surfaces were painted matt white and squadron codes were often dispensed with, only the aircraft letter being carried.

The most widely operated flying-boat in the R.A.F. was naturally the Short Sunderland, but the "Cat" was extensively used, the squadrons including Nos. 119, 190, 191, 202, 205, 209, 210, 212, 240, 244, 259, 262, 265, 270, 321 (Dutch), 330, 333, 413 (R.C.A.F.), 422 (R.C.A.F.), 490 and 628. Their patrols ranged from the Arctic Ocean to the Indian Ocean; and they were very popular with their crews. R.A.F. machines



Pacific colleagues (left) *PB2B-2*, A24-362, "*OX-V*", *of No. 43 Sqdn., R.A.A.F. and* (right) NZ4007, "*XX-I*", *of the R.N.Z.A.F. flying from Fiji.* (Photos: via R. Ward)

The PBY post-war (below, left) *an OA-10A used by the U.S.A.F. for air/sea rescue, June 1948 and,* (right) *PBY-6AG of the U.S. Coast Guard, San Francisco, July 1952—a rare type to find in Coast Guard markings.* (Photos: William T. Larkins)



JATO-assisted take-off of a Coast Guard PBY-5A, Miami, Florida, September 1949. (Official Coast Guard photo.)

participated in the sinking of at least three submarines (the German *U-452* and *U-253* and the Italian *Veniero*) and a flight of No. 240 Squadron was used on special duties, landing in enemy territory in the Burma-India theatre and supporting ground forces by parachute drops.

CANADIAN PBY's

Many Catalinas were built in Canada, both flying-boat and amphibian variants, which were designated "Canso" in R.C.A.F. service. The flying-boat entered service in June 1941, replacing the Stranraers of No. 5 Squadron—equipment being complete by October of that year. No. 116 Squadron equipped with the type late in 1941 and an aircraft of that unit damaged a German submarine in an action of 21st January 1942. As related above, Nos. 413 (Tusker) and 422 Squadrons R.C.A.F. operated the type with R.A.F. Coastal Command, and when based in Iceland and Scotland No. 142 Squadron R.C.A.F. set up an impressive record. On 17th April 1944, F/O Cooke and crew sank *U-342*; 3rd June 1944, F/L. R. E. McBride and crew sank *U-477*; 11th June, F/O. L. Sherman and crew sank *U-980*; 13th June, *U-715* sunk by W/C. C. G. W. Chapman and crew; 24th June, *U-1225* sunk by F/L. D. E. Hornell and crew; and 30th June 1944, *U-478* attacked and damaged by F/L. McBride's crew and sunk by an R.A.F. Liberator. F/L. Hornell was awarded the Victoria Cross for his attack and subsequent heroism. Earlier, on 4th May 1943, S/L. B. H. Moffit, A. F. C. of No. 5 Squadron R.C.A.F. sank *U-630* in the West Atlantic while based at Torbay, U.K.; he was awarded the D.F.C. for this attack.

The R.C.A.F. ultimately used a total of 30 Catalina flying-boats and 244 Canso and Canso A amphibians (excluding the machines supplied to Nos. 413 and 422 Squadrons through the R.A.F.). The last Canso in R.C.A.F. service was retired from duty with No. 121 Search and Rescue Flight, Sea Island, on 8th April 1962. One example of the Canso has been retained by the R.C.A.F. for museum display. (Unlike the R.C.A.F. the R.A.F. disposed of its Catalinas fairly soon after the war's end, patrol duties being carried on by Sunderland flying-boats).

A large number of Catalina flying-boats and Canso amphibians were built in Canada and deliveries were divided between the R.C.A.F. and the U.S.N. Under an agreement between the U.S. and Canadian governments in 1941, Canadian Vickers (of Montreal, P.Q.) and Boeing Aircraft of Canada (Vancouver, B.C.) began tooling up for production of the PBY-5A. Canadian Vickers delivered their first PBY-5A on 3rd April 1943 and by the time that production ceased on 19th May 1945, 369 aircraft of this type had been produced. Of these, 139 went to the R.C.A.F. and 230 to the U.S.A.A.F. (serials *44-33868* to *-34097*) designated 0A-10A. (Of this latter total of 230, a number were to have gone to the U.S.N. as PBV-1A's but none were delivered to that service.) The U.S. Army operated Catalinas primarily for search and rescue but a number were attached to the 12th Air Force in North Africa, carrying bomb-loads of 2,000 lb. beneath the wings.

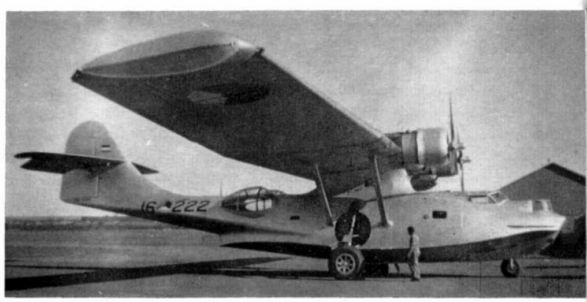
Boeing Aircraft of Canada built 240 flying-boats designated PB2B-1 entirely for Lend-Lease, some going to Britain as the Catalina IV and 41 going to the Royal New Zealand Air Force. The PB2B-2 was based on the PBN-1 Nomad; 50 were built and some went to the R.A.F. as Catalina VI's. Further production by Boeing comprised 17 PBY-5 flying-boats and 55 Cansos for the R.C.A.F.

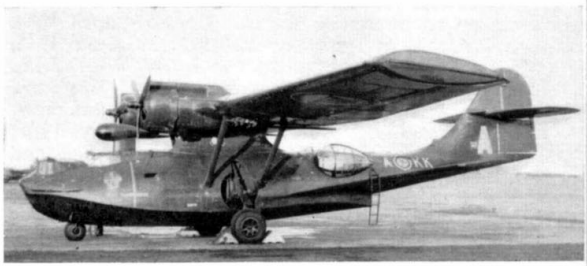
Canadian Vickers (later Canadair) also produced hulls and other major components for delivery to Consolidated-Vultee's New Orleans plant and, up to

An excellent view of Dr. Archbold's "Guba".
(Photo: Convair via Donato)

American Export Airlines' NX18997 (*later* NC18997) *showing the insignia and registration details.*
(Photo: Convair via Beerens Collection)

Four post-war military PBY-5's: (top) *Argentine Navy machine;* (upper middle) *Danish Air Force aircraft at the Marine Station, Copenhagen;* (lower middle) *Dutch Naval Air Force aircraft;* (bottom) *a machine of the Royal Norwegian Air Force.*
(Photos: Levy via Larkins, J. Stoppel and R. Ward)





VJ-Day, 119 hulls and 172 wing centre-sections were supplied. The Canadian aircraft were powered by 1,200 h.p. Pratt & Whitney R-1830 radials and armament was six 0·303 guns in the same positions as R.A.F. machines (see above). A maximum crew of nine could be carried. Normal bomb-load was four 500 lb. bombs or 450 lb. depth charges but a maximum overload of 8,000 lb. could be carried.

AUSTRALIA AND NEW ZEALAND

Two other Allied Air Forces, those of Australia and New Zealand, used the Catalina operationally—in both cases in the Pacific. Originally 18 Catalinas were ordered for the R.A.A.F. in 1940 and ferrying across the Pacific was organised by Qantas. This was for two reasons; Qantas was the prime source for pilots with sufficient long-distance flying experience, and also at that time the U.S. was still neutral and delivery would be simplified if undertaken by a civilian organisation. A condition of purchase was that the machines be flown under U.S. command to Honolulu where they would become Australian property. The delivery of the first aircraft was only the third trans-Pacific flight in history. By May 1942 over one hundred were on order and Nos. 11 and 20 Sqdns. R.A.A.F. were equipped with the type during 1942, both units being based at Cairns, Queensland.

Two other units, Nos. 42 and 43 Sqdns., later received the Catalina and the four squadrons built up an impressive record under difficult conditions in the Pacific theatre. The R.A.A.F. "Cats" were not only used for search and rescue but also for bombing, minelaying and supply-dropping. Like the R.A.F., the Australians did not keep their Catalinas for long after VJ-Day and by late 1946, the Catalina units had all been disbanded.

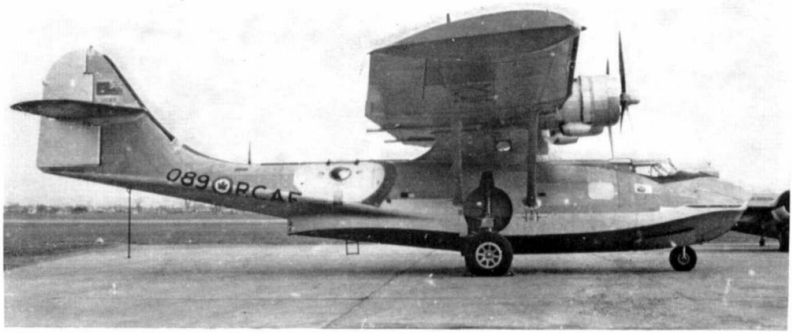
The R.N.Z.A.F. used the Catalina in the same belligerent spirit as the R.A.A.F., two units operating from Fiji. No. 6 Sqdn. was formed in May 1943 and No. 5 Sqdn. reformed on Catalinas (originally having used Short Singapore flying-boats until late 1942) in July 1944. After distinguished service, they relinquished their "Cats" during the latter half of 1945.

WINGS FOR THE U.S. NAVY

Naturally enough the U.S. Navy was the main user of the PBY (the British name of Catalina even spread to that service, but it will always be remembered by that force as the PBY). By June 1938 thirteen of the then-eighteen established Navy patrol squadrons used PBY-1, 2 or 3 flying boats; these were VP-2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16 and 17. Expansion proceeded apace and by September 1941, 20 units were equipped with PBY's and six units (VP-83, 84, 91, 92, 93 and 94) were awaiting formation with PBY-5A amphibians.

With the outbreak of war in the Pacific, the PBY obviously assumed an even greater importance than it had done while protecting U.S. interests in peacetime. The initial Japanese attacks had gravely affected the ability of the U.S. to strike back and the PBY was needed to give warning of further Japanese onslaughts as well as to take the fight to the enemy. The last two aircraft to leave beleaguered Corregidor in the Philipines were PBY's. A PBY located the Japanese force speeding to attack Dutch Harbor in the Aleutians, another located the Japanese approaching Midway, while PBY-5A's launched the very first attack on Japanese surface ships to open the Battle of Midway.

As the tide turned the PBY (affectionately named "Black Cat" or "Dumbo") was able to carry battle to the Japanese and also, to concentrate on its mercy mission of air-sea rescue. On 24th November 1943, B-25 Mitchells made one of their many attacks on Japanese shipping in the Solomon Islands. Air opposition had almost vanished but Japanese A.A. fire was still highly effective. A B-25 of the 70th Bombardment Squadron "ditched" in the sea about eight miles from Ballale, Kahili and Shortland Island. The crew, led by Lt. James J. Dickinson, took to their life rafts and waited for rescue. Three hours later a PBY escorted by R.N.Z.A.F. fighters came in to rescue them. During intense A.A. and heavy shellfire from coastal batteries, the PBY flew in, picked up the



The last Canso, 11089, of the R.C.A.F. seen in 1962, shortly before retirement.
(Photo: via R. W. Harrison)

B-25 crew and flew them back to their base in time to enjoy their Thanksgiving dinner.

One of the most striking rescues of the war took place on 15th February 1944, during an attack by A-20, B-25, P-38 and P-47 aircraft on Kavieng Harbor at Rabaul in the South Pacific. Covered by P-47's, a "Dumbo" piloted by a Lt. Gordon made two landings to pick up nine men. At the same time Major Chester A. Coltharp and Captain Anthony N. Chiappe of the 345th Fight Squadron strafed the Japanese gun positions to keep A.A. fire down. After the pick-up, while headed home, Major Coltharp spotted one man and two life rafts and called for the PBY to return. Although his PBY was damaged and the sea was rough, Lt. Gordon returned and made three more landings to pick up the "ditched" men before returning to base.

In the Aleutian Islands, the PBY crews faced insurmountable problems and their work can only be described as heroic. Patrolling the seas was an unrewarding hit-or-miss proposition—the only way to describe Aleutian weather is "stinking and miserable". Rain, snow, mist, 80 m.p.h. gales or overcast could confidently be expected 365 days a year.

PEACEFUL EXPLOITS

The first transcontinental flight ever attempted by a flying-boat was accomplished when a Consolidated Model 28 (commercial PBY) flew from San Diego to New York in 17 hours 3½ minutes. This particular aircraft was built for Dr. Richard Archbold, leader of an American Museum of Natural History Expedition to New Guinea. Dr. Archbold named it "Guba" a Motu word meaning "sudden storm", a name originally applied to a Fairchild amphibian lost in such a storm at Port Moresby, New Guinea in 1937. This first "Guba" was a PBY-2.

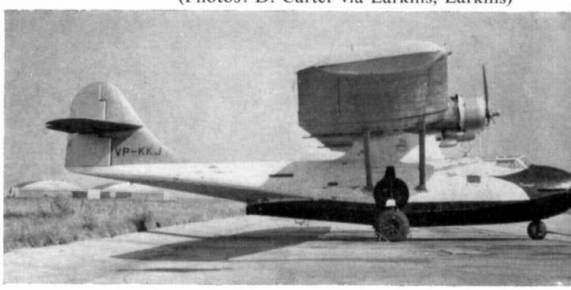
In August 1937, Dr. Archbold agreed to sell "Guba" to the Russian Government, which was organising a search for the Soviet aviator S. Levanevsky who had disappeared on a transpolar flight. The well-known British explorer Sir Hubert Wilkins headed the search and "Guba" was flown to Aklavik, 100 miles north of the Arctic Circle in the Northwest Territory of Canada. The aircraft eventually flew 19,000 miles in a period of one month over largely unsurveyed areas. The search proved fruitless and "Guba" was taken to Russia; although its ultimate fate is uncertain, Russian experience with "Guba" undoubtedly resulted in the Russian decision to obtain a manufacturing licence for the type.

Dr. Archbold eventually travelled to New Guinea in 1938 and this expedition purchased a replacement "Guba" registered *NC777*. A troublefree series of "hops" were made from San Diego to Hollandia, New Guinea, *via* Pearl Harbor and Wake Island between 2nd and 10th June 1938. The expedition covered the least-known large area of the island, the northern slope of the Snow Mountains. Some of the area was mapped for the first time and valuable notes on the people were recorded.

In eleven months, 168 flights were made and over 250 tons of supplies were ferried to the explorers. Many of "Guba's" landings were recorded on Lake Habbema, 200 miles inland and 11,000 feet above sea-level. Dr. Archbold later stated that "Guba" could do in ten minutes, work, that would normally take two years using ground transportation.

On completion of the ground exploration, the Australian government sought Dr. Archbold's help in surveying an air route across the Indian Ocean, which up to this time had never been flown. New engines were shipped from San Diego and installed. "Guba" left Hollandia on 12th May 1939, and flew by stages to Sydney, Austrialia. Then followed a non-stop crossing of Australia to Port Headland on 3rd June. The survey was carried out with stops at Cocos Island, Direction Island, Diego Garcia and Mahe in the Seychelles before arrival at

Two interesting civil machines: (left) CF-IKO *of Hycon Aerial Surveys at Los Angeles, 1956; note magnetometer beneath rear fuselage.* (Right) VP-KKJ *of Aquila Airways (formerly of East African Airways) at New York, 1953; previously this machine was* 44-34082, VR-HDS, VT-DEX, SE-XAD *and* SE-BWB.
(Photos: D. Carter via Larkins, Larkins)



Mombasa on the Kenya coast on 21st June. Africa was bridged in two hops, landing being made on Lake Victoria and on the Congo River at Coquilhatville. An overwater flight of 3,190 miles was made from Dakar, West Africa to St. Thomas, British West Indies in 19 hours 33 minutes on 29th-30th June. Next day "Guba" flew to New York and upon landing Dr. Archbold and his crew were quickly escorted to the Aviation Building at New York's World Fair for an official welcome. On 6th July "Guba" returned to San Diego to accomplish the first round-the-world flight ever made at the earth's largest diameter. It had in fact travelled about 40,000 miles.

"Guba" was bought by the British Purchasing Commission in 1940 and on 25th October of that year flew from Newfoundland to Scotland in 16½ hours. "Guba" was initially serialled *AM258* and soon after became *G-AGBJ* and was used by Saunders-Roe as a "hack" in 1944-45. When returned to the R.A.F., the erroneous serial *SM706* was applied. The aircraft was used for several years for experimental flying-boat landings, but "Guba" came to a sad end after its magnificent working record. Concrete blocks replaced the engines, and the aircraft sank in a gale. Shortly after, it was raised, stripped of useful equipment and sunk at sea.

AMERICAN EXPORT AIRLINES

The first steamship line to enter into the international air race across the Atlantic was the American Export Lines, long famous for its steamship operations. The company formed a subsidiary, American Export Airlines, and was of the opinion that with adequate financial backing the Atlantic could be flown quite safely. Survey flights were made along a proposed route from New York to Marseilles, France by way of Horta in the Azores and Biscarosse, France—a total distance of 3,900 miles. Alternative points of departure from the United States were considered in case New York weather conditions were unsuitable on any given day. The survey aircraft was a Consolidated 28-4 (PBY-2,) chosen primarily because of its long-range capability, excellent flying characteristics and past record on long over-water flights.

The particular "Cat" purchased by American Export was registered *NX18997* (later *NC18997*) and the cost was $200,000. American Export applied to the American C.A.A. for a "Certificate of Convenience and Necessity" on 8th May 1939, to fly regular commercial schedules on their prescribed routes across the Atlantic. In view of their inexperience, American Export were forced to hire recognised aviation and transportation leaders who could then build the airline into something capable of meeting the toughest demands of the C.A.A. A famous Navy pilot, Patrick J. Byrne, was hired (on loan) to head the flight department and many of the crew members were well-known aviators. Communications chief was Mr. Ford Studebaker, a well-known air-radio expert, formerly with the C.A.A. So efficient was one radio set installed by Studebaker that the "Cat" "worked" a Long Island, New York, station just sitting on the slipway at San Diego, California. The outbreak of the Second World War killed ideas of transatlantic flights but American Export was still functioning in 1942 with Sikorsky VS-44A flying-boats, although the ultimate fate of *NC18997* is not known.

EXISTING PBY's

It is impossible to keep a good aircraft down and like the DC-3, although not in such large numbers, the PBY soldiers on. After the war many countries purchased surplus aircraft and the U.S. Navy used the type until the 1950's. The other countries (besides the U.S. and Russia) to utilise the PBY post-war were the Argentine, Brazil, Chile, Denmark, Dominica, Ecuador, Indonesia (ex-Dutch machines), Israel, Mexico, Norway, the Netherlands and Peru.

Because of the current practice of using aircraft to fight forest fires, it was inevitable that the PBY should be chosen as a flying fire-engine. Most were of the

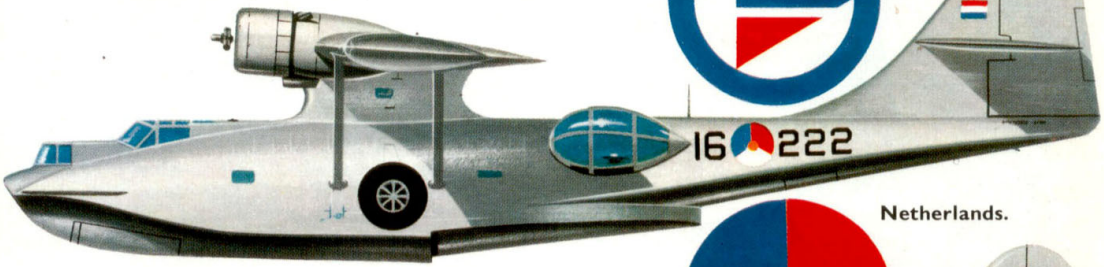
PBY-6A, N6453C, *water-bomber of B.B. Burson & Associates Inc.*, (above) *on the ground and* (right) *in action.* (Photos: William T. Larkins)

No. 333 Sqn.

PBY-5A of No. 333 Sqn., Royal Norwegian Air Force.

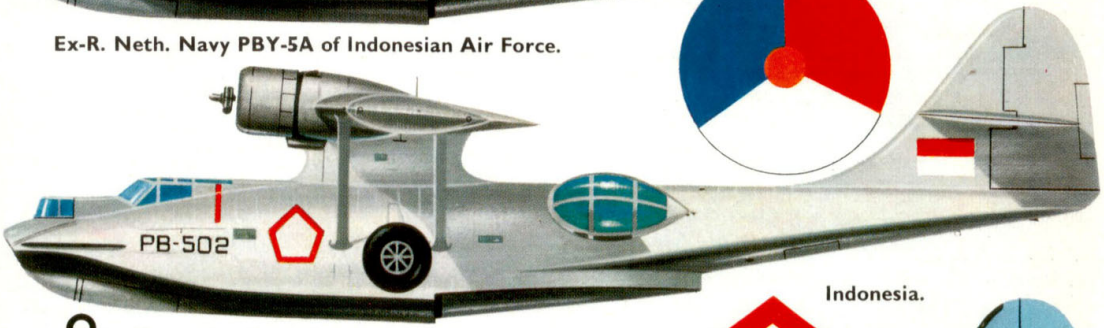
Norway.

PBY-5A of Royal Netherlands Navy, based in Dutch East Indies.



Netherlands.

Ex-R. Neth. Navy PBY-5A of Indonesian Air Force.



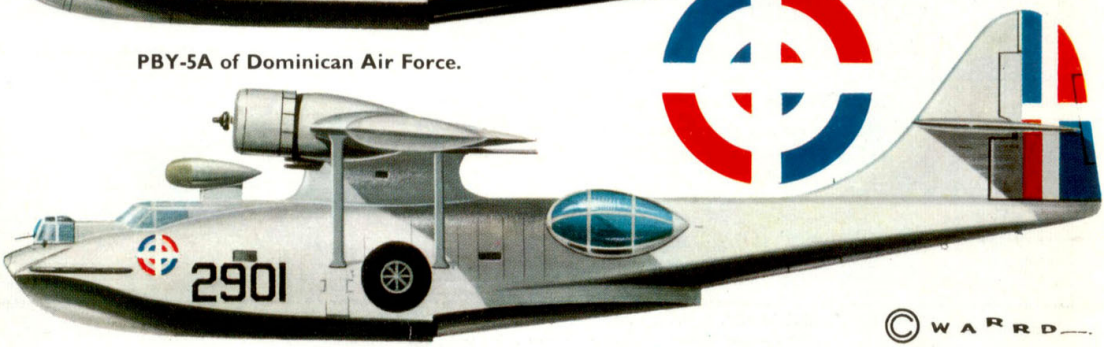
Indonesia.

Argentine Navy, four wing positions.

PBY-5A of Argentine Navy.

Dominican Republic.

PBY-5A of Dominican Air Force.



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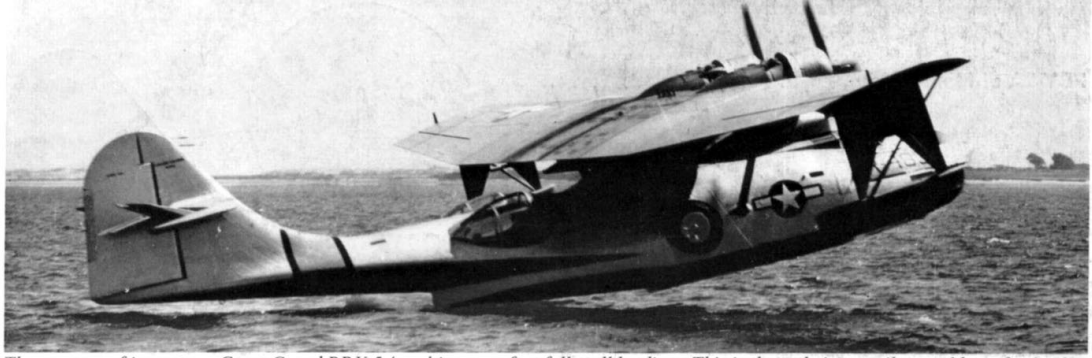

The moment of impact—a Coast Guard PBY-5A making a perfect full-stall landing. This is the technique a pilot would use for landing in the open sea. (Photo: Mitch Mayborn Collection)

PBY-6A version of which about 50 were flying in 1965. Many were converted as water-scoopers on a production-line basis; these PBY's could drop into a lake near the fire area, pick up 960 gallons of water in 14 seconds and then shortly dispel it over the "hot" area in a pattern of 9 by 190 feet. In June 1962 one of these aircraft dropped 112,320 gallons in one day (this machine was actually a modified PBY-5A).

One extremely interesting variation on the theme was PBY-5A *N9752Z* converted in the U.S. for borate work.

Besides extant "water bombers", PBY's are still in use for transportation, some owned by individuals and others by corporations. In 1967 thirty-three PBY-5A's are listed and about fifty PBY-6A's. One PBY-5A is in the collection of the National Air Museum of the Smithsonian Institute, Washington, D.C. and another (U.S. Navy serial *33966*) is held by the Connecticut Aeronautical Historical Association. In Canada several, all PBY-5A's, are operated by Austin Airways of Hamilton, Ontario. Production of the flying-boats totalled 1,196 and 944 amphibians were also built (details of Russian production are not available) but today nearly a hundred still survive, flying testimonies to the reliability of one of the world's classic aircraft.

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Author and publishers gratefully acknowledge the indispensable assistance of Ron Beerens and W. T. Larkins in the compilation of the tables below.

U.S. NAVY SERIALS

Model	No. Built	Serial Range	Delivery	Contract No.	Contract Date
XP3Y-1	1	*9459*		31792	10–28–33
(XPBY-1)	(1)	*9459*		48710	5–21–36
P3Y-1 to PBY-1	60	*0102–0161*	11 in 1936 49 in 1937	43087	6–29–35
PBY-2	50	*0454–0503*	36 in 1937, 14 in 1938	49653	7–25–36
PBY-3	66	*0842–0907*	1 in 1937, 65 in 1938	51701	11–27–36
PBY-4	32	*1213–1244*	18 in 1938, 15 in 1939	S&A 58101	12–18–37
XPBY-4 to XPBY-5	1	*1245*	1939	58101	12–18–37
PBY-5	165	*2289–2455* (*2290* to U.S. Coast Guard)		70496	12–20–39
PBY-5A	33	*2456–2488*		70496	12–20–39
PBY-5A	60	*7243–7302*		77713	11–25–40
PBN-1	155	*02791–02946*	(19 del 1945)	P.O. 3–42	7–16–41
PBY-5A	30	*02948–02977*		88476	6–30–41
PBV-1A	(none)	(*03563–03712*)	(150 a/c by Canadian Vickers—CANCELLED)		
PBY-5A	22	*04399–04420*		88476 ext.	10–27–41
PBY-5	90	*04425–04514*	1942	Nos. 91876	9–15–41
PBY-5A	74	*04972–05045*		Nos. 77713	
PBY-5A	94	*08030–08123* (includes 3 for Defense Aid and 12 for Army)		Nos. 88476 ext.	4–25–42
PBY-5	426	*08124–08549* (includes Defense Aid serials JV925–JV935)	1942 & 43	Nos. 91876 ext.	
PBY-5A	100	*33960–34059*			
PB2B-1 and PB2B-2		(See notes on Boeing of Canada) (*44188–44223* and *44228–44277*)			
PBY-5A	130	*46450–46579*			
PBY-5A	59	*46580–46638*			
PBY-6A	60	*46639–46698*			
PBY-6A	1	*46724*			
PBY-5A	200	*48252–48451*			
PBY-5	1	*63992*			
PBY-6A	107	*63993–64099*			
PBY-6A	7	*64101–64107*			
Canso A	230	*67832–68061* (Canadian Vickers OA-10A's for Army			
PB2B-1		*72992–73116?*			
PBY-6A	—	*64107–64441*, *64100* and *111149–111348* CANCELLED V-J Day			
PBY-6A	—	*119779–119978* CANCELLED V-J Day			

U.S.A.A.F. SERIAL NUMBER BLOCKS

Model	No. Built	Serial Range	Contract No.	Contract Date
OA-10	1	*42–109020*	NA-88476	
OA-10	2	*42–109021/109022*	NA-77713	
OA-10	3	*42–109023/109025*	NA-70496	
OA-10	12	*43–3259/3270*	NA-88476	12–18–41
OA-10	25	*43–43839/43863*	NA464	11–10–42
OA-10	6	*43–47956/47961*		
OA-10A-CO	56			
OA-10A-VI	230	*44–33868/34097*		
OA-10B-CN	75	*45–57833/57907*	Contract 45–13342 of	5–10–45

STRUCTURE

Construction : Flying boat hull; aluminium monocoque structure, extruded "X" bars reinforcing smooth skin. Underside of hull divided into compartments separated by solid-web type bulkheads.
Wings : Aluminium alloy stressed skin structure, "X" bar stiffeners, fabric covered ailerons and trailing edge, two outer panels and centre section incorporating integral fuel tank, wing attached by superstructure rising from centre of hull and braced thereto by four streamlined struts, bolts for attaching wings accessible through doors in top of cabane, retractable auxiliary floats forming tips of outer wing panels, struts for which fold inside wing and the bracing structure coming flush with the wing lower surface.
Tail assembly : Aluminium alloy stressed skin stabilizer and fin, fabric-covered aluminium alloy framed elevators and rudder later provided with trim tabs.

TECHNICAL DATA

Model	Engine : Horsepower	Gross Weight	Max. speed m.p.h.	Service ceiling ft.	Span	Length	Height
XP3Y-1	XR-1830-54 : 825 h.p.	19,793 lb.	169·2	18,600	104 ft.	63 ft. 6 in.	18 ft. 6 in.
XPBY-1	R-1830-64 : 850	20,226	184	24,000	104 ft.	63 ft. 6 in.	18 ft. 6 in.
PBY-1	R-1830-64 : 850	20,671	183	23,600	104 ft.	63 ft. 6 in.	18 ft. 6 in.
PBY-2	R-1830-64 : 850	21,779	175·5	20,900	104 ft.	67 ft. 10 in.	18 ft. 6 in.
PBY-3	R-1830-66 : 900	22,078	184·6	23,100	104 ft.	67 ft. 10 in.	18 ft. 6 in.
PBY-4	R-1830-72 : 1,050	22,295	198	25,400	104 ft.	65 ft. 2 in.	18 ft. 6 in.
PBY-5	R-1830-82 : 1,050	26,200	189·7	21,600	104 ft.	63 ft. 10 in.	18 ft. 11 in.
XPBY-5A	R-1830-72 : 1,050	24,817	192	20,200	104 ft.	65 ft. 2 in.	18 ft. 6 in.
PBY-5A	R-1830-92 : 1,050*	33,975	179	14,700	104 ft.	65 ft. 2 in.	20 ft. 2 in.
PBY-6A	R-1830-92 : 1,200 t.o.	34,000	196	15,000	104 ft.	63 ft. 11 in.	18 ft. 11 in.
Canso	R-1830-92 : 1,200 t.o.	34,000	185	19,000	104 ft.	64 ft.	17 ft. 11 in.

* 1,200 for take-off.

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